

SECTION 19

The Cardiovascular System

AHMED TWAFIQ

د. ايمان نبيل محمد
طب عام ج/الكوفة

1. the **MOST** appropriate action regarding the management of the child in above scenario is to

- A. send for renal ultrasound
- B. send for antinuclear antibody
- C. **adjust or stop medications**
- D. give non-steroidal anti-inflammatory medications
- E. collect blood culture and start antibiotics

2. The **LEAST** cardiac finding in Kawasaki disease is **Vascular not valvular**

- A. coronary artery aneurysm
- B. **valvular insufficiency** → Marfan
- C. coronary artery thrombosis
- D. myocardial infarction
- E. myocarditis

3. All the following matching of cardiac manifestations of systemic diseases are true **EXCEPT**

- A. Duchenne dystrophy cardiomyopathy
- B. Pompe disease short PR interval
- C. **Marfan syndrome coronary ischemia**
- D. systemic lupus erythematosus Libman-Sacks endocarditis
- E. neurofibromatosis pulmonic stenosis

Patients with Marfan syndrome may have aortic insufficiency, mitral insufficiency, or dissecting aortic aneurysm.

4. The **MOST** common form of congenital heart disease associated with Down syndrome is

- A. patent ductus arteriosus
- B. coarctation of aorta
- C. **atrioventricular septal defect**
- D. ventricular septal defect
- E. atrial septal defect



5. **VACTERL** association refers to cardiac malformation (usually VSD) and all the following malformations **EXCEPT**

- A. vertebral
- B. anal
- C. tracheoesophageal
- D. respiratory **Renal**
- E. limbs anomalies

6. The pulse pressure is determined by subtracting the diastolic pressure from the systolic pressure, it is normally below 50 mm Hg or half the systolic pressure, whichever is less. A wide pulse pressure may be seen in

- A. mitral insufficiency
- B. pericardial tamponade
- C. aortic stenosis
- D. anemia
- E. heart failure

The wide pulse pressure may be seen with aortopulmonary connections (patent ductus arteriosus, truncus arteriosus, arteriovenous malformations), aortic insufficiency, or relative intravascular volume depletion (anemia, vasodilation with fever or sepsis). A narrow pulse pressure is seen with pericardial tamponade, aortic stenosis, and heart failure.

7. Inspection is an integral part of cardiac examination. All the following are important aspects to look for in a child with heart disease **EXCEPT**

- A. perioral cyanosis
- B. nutritional status
- C. pallor
- D. clubbing of fingers
- E. dysmorphic features

Perioral cyanosis is a common finding, especially in pale infants or when infants and toddlers become cold. Isolated peripheral cyanosis (hands, feet) is associated with normal arterial saturation and increased peripheral extraction of oxygen. Central cyanosis (tongue, lips) is associated with arterial desaturation.

8. You are measuring blood pressure in an adolescent, which site you would use for measurement?

- A. right arm
- B. left arm
- C. left thigh
- D. right thigh
- E. 4 limbs

9. A single and loud S₂ is heard in

- A. TOF
- B. pulmonary atresia
- C. severe aortic stenosis
- D. d-TGA
- E. pulmonary hypertension **Loud P₂**

10. Of the following, an ejection systolic murmur is heard in

- A. mitral regurgitation *pansystolic*
- B. aortic regurgitation *early Diastolic*
- C. mitral prolapse *click*
- D. ventricular septal defect *pansystolic*
- E. atrial septal defect *ejection systolic*

11. The murmur that is described as "easily heard but not loud" is equal to grade

- A. grade I *faint → Require quiet Room to heard*
- B. grade II
- C. grade III
- D. grade IV
- E. grade V

12. A high pitch murmur is indicative of a/an

- A. large defect
- B. mild obstruction across the valve
- C. restrictive defect
- D. low pressure gradient
- E. innocent murmur

13. You are evaluating a well 4-year-old child in out-patient clinic, you heard a grade-III murmur at lower left sternal border which decreased in intensity when the child is upright; it is of vibratory quality.

Of the following, the **BEST** action is to

- A. check 4 limbs blood pressure
- B. order chest X-ray
- C. arrange for an appointment of echocardiography
- D. nominate as Still's murmur
- E. order an ECG

14. On a good inspiratory film, the cardiothoracic ratio in an infant should be less than

- A. 50%
- B. 55%
- C. 60%
- D. 65%
- E. 70%

And less than 50% in older children and adolescents.

15. On antero-posterior chest X-ray film; the major component of right cardiac silhouette is

- A. brachiocephalic vein
- B. inferior vena cava
- C. right atrium
- D. right ventricle
- E. pulmonary artery

16. A 6-year-old boy brought from crowded place during hot season to emergency department with history of collapse to ground after being pale. He lost consciousness with brief tonic movement for about one minute. On examination he was conscious, H.R 70/min, and B.P 60/45 mmhg.

Of the following, the **MOST** likely diagnosis is

- A. vasovagal syncope
- B. long QT syndrome
- C. hypertrophic obstructive cardiomyopathy
- D. seizure disorder
- E. pulmonary hypertension

17. The family of the child that is presented in question (16) is worried and asking about any investigation needed. Your **BEST** response is

- A. reassurance and discharge to home
- B. ECG
- C. EEG
- D. serum electrolytes
- E. neuroimaging study

18. Of the following, the **MOST** common cause of chest pain in pediatric population is

- A. ischemic pain
- B. severe cough
- C. reflux esophagitis
- D. vaso-occlusive crisis
- E. muscle strain

19. Classically when reading the ECG, we look to P wave to be upright in leads

- A. I and AVR
- B. II and AVF
- C. I and AVF

- D. strip of lead II
- E. AVL

20. A 4th year medical student asked you for an abnormal cardiac rhythm he felt in a 5-year-old well child. It was varying with respiration, of equal volumes and the rate was 120/min.

Your answer that, this is a/an

- A. sinus tachycardia
- B. supraventricular tachycardia
- C. sinus arrhythmia
- D. atrial extrasystoles
- E. atrial flutter

21. You are a resident in NICU when called to see a 7-day-old boy who had an abnormal ECG that shows different P wave morphology (upright, notched or biphasic), PR intervals were variable and QRS was normal. He was hemodynamically stable.

Of the following, the **MOST** likely diagnosis is

- A. Wenckebach heart block
- B. Mobitz I heart block
- C. complete heart block
- D. wandering atrial pacemaker
- E. supraventricular tachycardia

22. You are attending duty in emergency department, when a 2-week-old baby girl brought with tachycardia. She was mottled with weak pulse and hypotension. The 12-leads ECG shows HR of 242/min, narrow QRS and variable P wave morphology and position.

Of the following, the **MOST** likely diagnosis is

- A. wandering atrial pacemaker
- B. sinus tachycardia
- C. supraventricular tachycardia
- D. atrial flutter
- E. ventricular fibrillation

23. The **BEST** treatment option for the baby in the previous scenario is

- A. bag of ice water to face
- B. adenosine
- C. digoxin

Because its shocking

- D. sotalol
- E. synchronized cardioversion

24. An 8-year-old asthmatic child on oral theophylline, referred to cardiology clinic because of irregular heart beat. He was hemodynamically stable; his ECG showed premature, wide QRS complexes with large inverted T wave, treadmill ECG testing showed disappearance of ventricular contractions.

Of the following, the **BEST** action is to

- A. reassure parents and discontinue medication
- B. send for drug level
- C. send for echocardiography
- D. start oral amiodarone
- E. admit and observe for 24 hours

Patients with premature ventricular contractions with normal echocardiography and treadmill test can be discharged home and no treatment is required. But in this scenario the adjustment of theophylline dose and or drug level is more important as it may be the cause of this event. Ventricular tachycardia defined as three or more consecutive premature ventricular contractions which need treatment in symptomatic child with synchronized cardioversion shock and in asymptomatic child with lidocaine or amiodarone.

25. Which of the following is a cyanotic congenital heart disease?

- A. atrioventricular septal defect
- B. severe aortic stenosis
- C. coarctation of aorta
- D. pulmonary atresia
- E. patent ductus arteriosus

26. An 8-month-old baby boy who is a known case of RSV induced wheeze on salbutamol inhalational therapy, found to have loud cardiac murmur and echocardiography shows small perimembranous VSD.

Of the following, the **BEST** advice to the parents is to

- A. reassure and continue on salbutamol
- B. stop salbutamol and refer to pediatric cardiologist
- C. start diuretics therapy
- D. start afterload reducing agent
- E. refer for cardiac closure device

27. A 3-month-old baby boy who is a known case of large VSD with failure to gain weight has fussiness, excessive sweating, grade III/VI systolic murmur at LLSB with faint diastolic murmur at apex and loud S2. ECG showed right ventricular hypertrophy. He is on anti-failure therapy (diuretics, afterload reducing agent and digoxin). His mother is describing attacks of cyanosis with crying.

Of the following, the **BEST** action is to

- A. escalate antifailure therapy
- B. advice for serial echocardiography

C. refer to pediatric cardiologist

D. refer for CT angiography scan

E. add a potent diuretics

28. Of the following, the **LEAST** common type of ASD is

A. patent foramen ovale

B. secundum

C. primum

D. sinus venosis

E. complete atrioventricular canal

29. The type of VSD which is nearest to the arterial valves (aorta or pulmonary) is called

A. perimembranous

B. supracristal

C. muscular

D. inlet

E. apical

Which carries the highest risk of valve regurgitation and usually needs surgical closure even if it is small.

30. You are evaluating a 7-day-old full-term baby girl with improving respiratory distress due to congenital pneumonia, the parents concern about echocardiography which shows small PDA.

Of the following, your **BEST** answer is

A. almost all PDAs discovered in this time will be closed

B. we need to do another echo after few weeks

C. no need for follow up as these defects rarely causes symptoms

D. starting diuretic therapy will improve the outcome

E. giving 3 days course of parenteral ibuprofen

→ to give trial of PDA close

31. A 10-week-old infant presented with tachypnea, tachycardia, and faint cardiac murmur with loud S_2 , saturation was 94% with 2 liters of nasal O_2 , cardiomegaly on chest X-ray, ECG shows biventricular hypertrophy, biphasic P wave with left superior axis. You are discussing the possibilities with a senior colleague.

Of the following, the **MOST** likely diagnosis is

A. large VSD

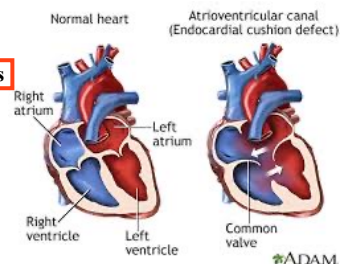
B. tricuspid atresia

C. endocardial cushion defect

D. left hypoplastic heart syndrome

E. right hypoplastic heart syndrome

Develop hF as soon as



32. A 3-year-old girl referred from health center with history of recurrent chest infections and cardiac murmur. On examination, she found to be under weight, having wide pulse pressure, and continuous, machine-like murmur heard at the left infraclavicular area, radiating to the back.

Of the following, the **MOST** likely diagnosis is

- A. peripheral pulmonary stenosis
- B. coarctation of aorta
- C. tricuspid regurgitation
- D. patent ductus arteriosus**
- E. aortic regurgitation

33. A 4-year-old boy observed by his parents to have exertional dyspnea and easy fatigability. On examination found a well-child with no dysmorphic features with grade III systolic murmur at the second left intercostal space that radiates to the back. S2 is widely split, and a heave is felt at the lower left sternal border.

Of the following, the **MOST** likely diagnosis is

- A. peripheral pulmonary stenosis
- B. patent ductus arteriosus
- C. aortic stenosis
- D. pulmonic stenosis**
- E. coarctation of aorta

34. The echocardiography done for the patient mentioned in the question 33 shows severe subvalvular muscular pulmonic stenosis.

Of the following, the **BEST** option for management is

- A. surgical repair**
- B. balloon valvoplasty
- C. diuretics
- D. afterload reducing agents
- E. watchful waiting according to symptoms

indicated in p.s if → ① subvalvular
② failure balloon valvuloplasty

35. A young parents consulted you about the result of echocardiography for their 9-month-asymptomatic baby with mild pulmonary stenosis.

Of the following, the **MOST** appropriate response is that

- A. we need to do follow him up by serial echocardiography
- B. we need to arrange catheterization for him
- C. the problem is not progressive especially if it is mild**
- D. the option of balloon valvuloplasty is valid if became more severe
- E. the surgery is the last option for treatment

The murmur of coarctation of aorta (COA) is typically best heard in the left interscapular area of the back. If significant collaterals have developed, continuous murmurs may be heard throughout the chest. For the above scenario the best next action is checking the pulse in all extremities and checking the 4 limbs blood pressure. Doing complete neurological assessment is also important but not the first choice. MRI of lumbosacral area to rule out tethered cord. After complete and proper physical examination sending for echocardiography and renal ultrasound will be next most appropriate action.

36. A 12-year-old adolescent boy complaining from leg discomfort with exercise, headache, and frequent epistaxis. A continuous murmur heard throughout the chest and back. He was well with good body built but the blood pressure found to be high.

Of the following, the **BEST** next action is to

- A. check pulses in all extremities
- B. do complete neurological examination
- C. send for MRI of lower spine
- D. send for renal ultrasound
- E. send for echocardiography

COA
significant collateral
Continuous Murmur

37. You are evaluating a 9-year-old child with coarctation of aorta.

Of the following, the **MOST** likely associated anomaly is

- A. hypoplastic aortic arch
- B. ventricular septal defect
- C. coarctation of abdominal aorta
- D. corrected transposition of great arteries
- E. abnormal aortic valve

38. A 6-day-old baby boy presented with sudden severe respiratory distress and grunting. Heart rate was 180/min, RR 80/min, B.P 50/40, O₂ saturation 75% with 0.6 FiO₂. No evident murmur heard but evident hepatomegaly. Chest X-ray shows cardiomegaly and increased lung plethora.

All the following lesions can have similar presentation **EXCEPT**

- A. total anomalous pulmonary venous drainage
- B. hypoplastic left heart syndrome
- C. coarctation of aorta
- D. single ventricle
- E. d-TGA

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39. The echocardiography of the baby in question 38 shows severe coarctation of aorta.

Of the following, the **BEST** action is to do/give

- A. urgent balloon angioplasty
- B. infusion of prostaglandin E1
- C. diuretics
- D. inotropes
- E. surgery

40. The **MOST** common cyanotic lesion presenting in the newborn period is

A. tetralogy of Fallot

B. d-transposition of great arteries

C. l-transposition of great arteries → in neonatal period

D. pulmonary atresia

E. hypoplastic left heart syndrome

↳ cause Death in 1st Month.

TOF is the most common cyanotic congenital heart defect, while hypoplastic left heart syndrome is the most common cause of death from cardiac defects in the first month of life. D-TGA (transposition of great arteries) is the most common cyanotic heart defect present in neonatal period.

41. Tetralogy of Fallot is composed of ventricular septal defect (VSD), overriding aorta, right ventricular hypertrophy, and **COMMONLY** with

A. subvalvular pulmonary stenosis

B. valvular pulmonary stenosis

C. supravulvular pulmonary stenosis

D. atretic pulmonary valve

E. absent pulmonary valve

42. In tetralogy of Fallot, the coronary anatomy is required by surgeon (just to avoid its injury during surgical repair). The associated coronary anomalies in TOF is about

A. 1%

B. 5%

C. 10%

D. 15%

E. 20%

in TOF

43. The management of hypoxic (Tet) spells include all the following **EXCEPT**

A. O₂ administration

B. knee-chest position

C. sodium bicarbonate infusion

D. morphine sulfate IM

E. phenylephrine IV

Tet spells: intermittent hypercyanotic, hypoxic episodes with a peak incidence at 2-4 months after birth
- these Spells are Associated with psychological and physical stress (e.g., crying, feeding, defecation)
- these Spells are Caused by either an increase in pulmonary vascular resistance (PVR) or a decrease in systemic vascular resistance (SVR) → intermittent worsening of RVOTO and ↑ right-to-left shunting
- Spells occur suddenly and are potentially lethal.
- Untreated children tend to squat: squatting → ↑ SVR → ↓ right-to-left shunt → ↑ blood flow to pulmonary circulation → ↓ hypoxemia → relief of symptoms. (High yield)

44. A concerned parents of a 2-month-old baby boy who recently diagnosed as tetralogy of Fallot asking about the timing of operation. You told them that the main decisive factor in timing of surgical repair depends on the

A. degree of pulmonary stenosis

B. occurrence of cyanotic spells

C. degree of right ventricular hypertrophy

D. degree of nail clubbing and O₂ saturation

E. development of heart failure

45. A 5-year-old girl who had recently operated successfully for TOF, she had dental decay and want to attend dental clinic. The correct statement regarding subacute bacterial endocarditis prophylaxis

- A. no need for prophylaxis
- B. it is indicated until 12 months after complete repair
- C. 2 years of prophylaxis is indicated
- D. an 18 months of prophylaxis is usually enough
- E. **should be continued for 6 months after complete repair**

46. A fullterm baby boy presented with cyanosis and tachypnea, his echocardiography showed d-Transposition of great arteries with ASD and PDA, he is on prostaglandin E1 infusion. His mother was much concerned about the timing emergency of operation.

Of the following, the **BEST** answer is that

- A. it depends on clinical progress of the disease
- B. usually performed in first 2 months of life
- C. we will perform a serial echocardiography to assess the ventricular function
- D. it depends on type of surgery we are going to do
- E. **it's better to be done in first 2 wks of life**

TOF → no ASD → Rashkind procedure
 → ASD → arterial switch → < 3-4 week
 → VSD → 2 month.

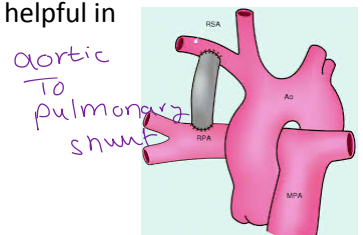
The arterial switch usually is performed within the first 2 weeks of life, when the left ventricle can still maintain systemic pressure.

47. All the following congenital heart diseases may present without murmur, but the one which always present without cardiac murmur is

- A. coarctation of aorta
- B. tricuspid atresia
- C. total anomalous pulmonary venous return
- D. transposition of great arteries
- E. **hypoplastic left heart syndrome**

48. Subclavian artery-to-pulmonary shunt (Blalock-Taussig procedure, B-T shunt) is a famous palliative surgery in pediatric cardiology. It can be helpful in

- A. **pulmonary atresia**
- B. d-TGA
- C. hypoplastic left heart syndrome
- D. total anomalous pulmonary venous drainage
- E. truncus arteriosus



49. The use of prostaglandin E1 may be useful in all of the following lesions **EXCEPT**

- A. d-TGA

- B. hypoplastic left heart syndrome
- C. tricuspid atresia
- D. truncus arteriosus
- E. pulmonary atresia

50. You are evaluating a 5-year-old girl with non-operated complex cyanotic congenital heart disease (CCHD) in cardiology clinic, she is complaining of fatigue, tightness of the chest and numbness of limbs. She is hemodynamically stable but lab. test shows HTC of 68%.

Of the following, the **MOST** appropriate next step in treatment is

- A. phlebotomy → venosection
- B. assessing iron level
- C. rehydration
- D. watchful waiting
- E. refer to neurologist

51. Of the following ECG findings, the one that is **BEST** match pericarditis (with or without effusion) is

- A. decrease rate $\alpha \rightarrow \uparrow \text{HR}$
- B. electrical alternans
- C. wide QRS voltage $\alpha \rightarrow \text{narrow QRS}$
- D. short PR interval $\alpha \rightarrow \text{PR} \downarrow$
- E. depressed ST segments $\alpha \rightarrow \text{ST} \uparrow$

52. Of the following, the complication that is related to right-left shunt in cyanotic congenital heart disease is

- A. gingival hypertrophy
- B. retarded growth
- C. CNS stroke and CNS Abscess
- D. lung abscess
- E. clubbing

53. The major determinants of cardiac function include all the following **EXCEPT**

- A. heart rate
- B. left end diastolic volume
- C. cardiac contractility
- D. afterload
- E. stroke volume

54. In a fetus, all the following are possible causes of heart failure **EXCEPT**
- A. fetal-maternal transfusion
 - B. SVT
 - C. atrioventricular valve insufficiency
 - D. large mixing defects**
 - E. teratomas
55. The principle cause that is lead to the development of heart failure in infants with left-right shunt after 2 mo
- A. the shunt across the defect is increased
 - B. the pulmonary flow to systemic flow is less than 2-1
 - C. the flow across the defect tend to be less restrictive in this age
 - D. the pulmonary vascular resistance is decreased in this age**
 - E. this is the age when early pulmonary hypertension is usually developed
56. In predominantly left sided heart failure, all the following are recognized findings **EXCEPT**
- A. hepatomegaly**
 - B. tachypnea
 - C. orthopnea
 - D. wheezing
 - E. pulmonary edema
57. A previously well 2-month-old baby presented to ER with tachypnea, examination shows HR of 170/min, good peripheral pulses, normal blood pressure and O₂ saturation was 89%. The cardiac murmur was grade II at LLSB with faint diastolic murmur at apex. Chest X-ray shows CT ratio of 72% and echocardiography shows large VSD. You admitted the baby and started supportive care (semi-sitting position and O₂).
- Of the following, the **BEST** option of treatment is to start
- A. loop diuretics
 - B. loop diuretics and afterload reducing agent
 - C. loop diuretics, afterload reducing agent and digoxin
 - D. loop diuretics, afterload reducing agent and spironolactone**
 - E. inotropes plus option D
58. Of the following, the **LEAST** clinical finding in acute rheumatic fever is
- A. migratory arthritis
 - B. pancarditis

- C. subcutaneous nodule *not in Acute*
- D. erythema marginatum
- E. Sydenham chorea

59. Of the following, the criteria of rheumatic fever which does not need evidence of recent group A streptococcal disease is

- A. migratory arthritis
- B. Sydenham chorea
- C. pancarditis
- D. subcutaneous nodule
- E. erythema marginatum

60. All the following are minor criteria for acute rheumatic fever **EXCEPT**

- A. fever (39°- 40°C)
- B. prolonged PR interval
- C. elevated CRP
- D. previous rheumatic fever
- E. arthralgia

61. A 6-year-old boy who had diagnosed as acute rheumatic fever with arthritis and carditis. Parents were so worried about heart lesion.

Of the following, the **MOST** appropriate statement describing the prognosis of heart disease

- A. actually it is a chronic disease which may lead to valve stenosis
- B. the chance of cure is minimal and long term prophylaxis is indicated
- C. most patients will recover that illness after proper treatment
- D. prednisolone therapy can cure almost all the cardiac lesions
- E. oral prophylaxis is indicated for 5 years

62. In dilated cardiomyopathy the usual presenting sign/symptom is

- A. chest pain
- B. cardiogenic shock
- C. sudden death
- D. syncope
- E. tachypnea

63. The echocardiographic description of massive atrial dilation is seen in

- A. restrictive cardiomyopathies
- B. dilated cardiomyopathies

- C. hypertrophic cardiomyopathies
- D. viral myocarditis
- E. noncompaction cardiomyopathies

64. In ^{HOCM}hypertrophic cardiomyopathy, the drug of choice usually is

- A. positive inotropes
- B. diuretics
- C. afterload reduction
- D. β -Blockers**
- E. antiarrhythmics

65. A 6-year-old boy who is on maintenance treatment of acute lymphoblastic leukemia with CNS infiltration, received irradiation course in the last month. He developed chest pain which seems to be reduced with sitting position, and dyspnea. By examination you found the HR 140/min, distended neck veins, inspiratory increase in jugular venous pressure, distant heart sounds, pericardial knock, hepatomegaly and mild ascites.

Of the following the **MOST** likely diagnosis is

- A. restrictive cardiomyopathy
- B. constrictive pericarditis**
- C. dilated cardiomyopathy
- D. hypertrophic cardiomyopathy
- E. viral myocarditis

66. A 5-year-old girl with large ASD who had recently underwent surgical repair, came to you on follow up with fever, on evaluation you heard distant heart sounds and friction rub otherwise, the child is hemodynamically stable. Acute phase reactant was increased with leukocytosis and shift to left. Echocardiography showed mild-moderate pericardial effusion.

Of the following, the **MOST** likely cause is

- A. cardiac tamponade
- B. infective endocarditis
- C. postcardiotomy syndrome**
- D. wound infection
- E. rheumatic fever

67. You are evaluating a 3-year-old boy with truncus arteriosus; he is on antifailure medications (diuretics and ACEi). Mother said that, the child has painful swelling of his ankle with intermittent red urine.

Of the following, the **MOST** likely diagnosis is

- A. uric acid nephropathy
- B. bacterial endocarditis
- C. lupus nephritis
- D. drug induced hemolytic anemia
- E. bacterial sepsis

تم بحمد الله وتوفيقه

د. ايمان نبيل محمد
طب عام ج/الكوفة

SECTION 19

The Cardiovascular System

ANSWERS

AHMED TWAFIQ

1.(C). The child is on antifailure therapy; diuretics including loop and thiazide diuretics can cause hyperuricemia which manifest in this child as uric acid nephropathy and arthropathy. Initially you need to do RFT and s.uric acid; stop diuretic and to start allopurinol.

2.(B).

3.(C). Patients with Marfan syndrome may have aortic insufficiency, mitral insufficiency, or dissecting aortic aneurysm.

4.(C). About 60% of persons with Down syndrome have congenital heart disease; of those about 60% are affected by endocardial cushioning defect (atrioventricular septal defect).

5.(D). Renal.

6.(D). The wide pulse pressure may be seen with aortopulmonary connections (patent ductus arteriosus, truncus arteriosus, arteriovenous malformations), aortic insufficiency, or relative intravascular volume depletion (anemia, vasodilation with fever or sepsis). A narrow pulse pressure is seen with pericardial tamponade, aortic stenosis, and heart failure.

7.(A). Perioral cyanosis is a common finding, especially in pale infants or when infants and toddlers become cold. Isolated peripheral cyanosis (hands, feet) is associated with normal arterial saturation and increased peripheral extraction of oxygen. Central cyanosis (tongue, lips) is associated with arterial desaturation.

8.(A). Initially, blood pressure is measured in the right arm. If elevated, measurements in the left arm and legs are indicated to rule out coarctation of the aorta.

9.(E). In TOF and pulmonary atresia it will be single but decreased intensity, in severe aortic stenosis it will paradoxically split, and in d-TGA it will be single with normal intensity.

10.(E). In mitral regurgitation and ventricular septal defect the murmur are pansystolic, in aortic regurgitation is diastolic, while in mitral prolapse it is late systolic with ejection click, in ASD the murmur result from increase flow through the pulmonary valve. Systolic ejection murmurs require the ejection of blood from the ventricle and may occur with aortic stenosis, pulmonary stenosis, atrial septal defect (ASD), and coarctation of the aorta.

11.(B).

12.(C). In case of high frequency (high pitch) murmur, it is usually indicative of a smaller defect is present (like small VSD) or more severe obstruction (like moderate or severe PS).

13.(D). Still's murmur is one of the innocent cardiac murmurs that manifest between the ages of 3-6 years, it is a systolic ejection murmurs that is usually heard at LLSB or between LLSB and apex, with grades I-III/VI, of vibratory or musical quality and it is intensity decreases in upright position.

14.(B). And less than 50% in older children and adolescents.

15.(C). The component of right cardiac silhouette from top to bottom are superior vena cava then right atrium, while the component of left cardiac silhouette from top to bottom are aorta; pulmonary artery; left atrium; left ventricle. Assessment of the location and size of the heart and cardiac silhouette may suggest a cardiac defect.

16.(A). Vasovagal syncope, usually happens after stimulation (like what happens in given scenario) while in neurocardiogenic syncope, it happens during rest. Long QT syndrome can be excluded by normal ECG, while in hypertrophic obstructive cardiomyopathy; the episode occurs after exercise and associated with chest pain and shortness of breath. A seizure disorder does not fit the prodrome and postictal phase of the given scenario, while the presentation widely differs in pulmonary hypertension (cyanosis after exercise).

17.(B). ECG is mandatory in syncopal disorders to rule out long QT syndromes (measuring corrected QT interval which should be less than 0.45 msec), after that reassurance and anticipation (means trying to avoid similar situation in future) of events are the only discharging messages to the family.

18.(E). Most diagnosable chest pain in childhood is musculoskeletal in origin (osteochondritis and muscle overuse and strain). A significant amount remains idiopathic. Ischemia is associated only in certain situations like coronary artery abnormalities which presents early in life, severe AS or PS and HOCM. Pulmonary causes are also common as asthma (often exercise-induced), severe cough and pneumonia. Reflux esophagitis remains in between the common gastrointestinal causes of chest pain.

19.(C). Looking for sinus rhythm and the normal axis of P wave in lead I and AVF when it should be upright. P wave is inverted in AVR. In dextrocardia P wave in both (lead I and AVF) may be inverted in addition to right axis deviation and upright P wave and QRS complexes in AVR.

20.(C). Sinus arrhythmia is a common finding in children and represents a normal variation in the heart rate associated with breathing. The heart rate increases with inspiration and decreases with expiration, producing a recurring pattern on the

electrocardiogram (ECG) tracing. Sinus arrhythmia is normal and does not require further evaluation or treatment.

21.(D).

22.(C). Supraventricular tachycardia is the most common symptomatic dysrhythmia in pediatric patients (supraventricular is narrow QRS tachycardia while ventricular is wide QRS tachycardia). If there is structural heart disease or the episode is prolonged (>12 hours), there may be alteration in the cardiac output and development of symptoms of heart failure.

23.(E). In hemodynamically stable child the treatment options start with vagal maneuvers then adenosine. Digoxin can be used in patients how are known not to have WPW syndrome as maintenance therapy. Oral sotalol can be used with certain precautions by doses according to age. Synchronized cardioversion is the definite option in the hemodynamically unstable children.

24.(B). Patients with premature ventricular contractions with normal echocardiography and treadmill test can be discharged home and no treatment is required. But in this scenario the adjustment of theophylline dose and or drug level is more important as it may be the cause of this event. Ventricular tachycardia defined as three or more consecutive premature ventricular contractions which need treatment in symptomatic child with synchronized cardioversion shock and in asymptomatic child with lidocaine or amiodarone.

25.(D). Acyanotic congenital heart disease includes left-to-right shunts resulting in an increase in pulmonary blood flow (like PDA, VSD, ASD) and obstructive lesions (like AS, PS, COA), which usually have normal pulmonary blood flow, while pulmonary atresia is a cyanotic congenital heart disease and it is usually a duct-dependent lesion.

26.(A). Inhalational and nebulized B-agonist has no effect on cardiac status. Small left- right lesions usually close spontaneously and does not cause cardiac failure.

27.(C). The baby in this scenario shows evidence of pulmonary hypertension (attacks of cyanosis with crying and his ECG shows right ventricular predominance). Starting sildenafil and arranging for early surgical intervention (either complete correction or easier operation of pulmonary artery banding) is the best action. It should be referred to pediatric cardiologist (again) to take an action.

28.(D). It can be associated with anomalous pulmonary venous return. Secundum is the most common type. Patent foramen ovale is a normal defect at atrial septum which can close spontaneously later on. Complete atrioventricular canal is a separate entity which present more commonly in patients with Down syndrome.

29.(B). Which carries the highest risk of valve regurgitation and usually needs surgical closure even if it is small.

30.(B). Most PDAs discovered in a full-term few days after birth are functional and usually closes within few weeks, so repeating an echocardiography after few weeks is the most reasonable answer. Small PDAs which remains opened; closing them by closure device is controversial. The use of prostaglandin inhibitors for significant PDAs has a role in preterm babies.

31.(C). This scenario shows an infant presented with heart failure sooner after reduction of pulmonary vascular resistant by 8 wks of life which usually happens with large Lt-Rt shunts. Presence of left axis deviation and absence of cyanosis make the diagnosis of complete atrioventricular septal defect (one type of endocardial cushioning defects) the most likely one, while in presence of cyanosis, tricuspid atresia is the most likely diagnosis.

32.(D). In between the mentioned options wide pulse pressure can present in aortic regurgitation and PDA, but with AR the murmur is usually diastolic.

33.(D). All the mentioned options have a murmur which radiates to the back except AS which radiate to the neck. Peripheral pulmonary stenosis usually does not cause symptoms. Other options can be differentiated by the character of murmur. Presence of left sternal heave which is associated with right ventricular hypertrophy, support the diagnosis of PS.

34.(A). Surgical repair is required if balloon valvuloplasty is unsuccessful for valvular PS or when subvalvular muscular stenosis is present.

35.(C). Valvular pulmonary stenosis usually does not progress, especially if it is mild.

36.(A). The murmur of coarctation of aorta (COA) is typically best heard in the left interscapular area of the back. If significant collaterals have developed, continuous murmurs may be heard throughout the chest. For the above scenario the best next action is checking the pulse in all extremities and checking the 4 limbs blood pressure. Doing complete neurological assessment is also important but not the first choice. MRI of lumbosacral area to rule out tethered cord. After complete and proper physical examination sending for echocardiography and renal ultrasound will be next most appropriate action.

37.(E). An abnormal aortic valve is present approximately 50% of the time, causing a systolic ejection click and systolic ejection murmur of aortic stenosis. Hypoplastic aortic arches, abnormal aortic valves, and VSDs are frequent associations with infantile type of COA.

38.(D). The presentation of hypoperfusion, right sided volume overload, cyanosis and respiratory distress are common presentation of ductal dependent lesions (option B, C, and also in E in certain situation when no VSD and the ASD is restrictive and small). In option A this is usually the presentation with obstructive

type. In option D the presentation is usually later (it may take 2-3 month) when the symptoms of heart failure develops rather than cyanosis.

39.(B). All the options are true but in order of B; C; D; A and later on E.

40.(B). TOF is the most common cyanotic congenital heart defect, while hypoplastic left heart syndrome is the most common cause of death from cardiac defects in the first month of life. D-TGA (transposition of great arteries) is the most common cyanotic heart defect present in neonatal period.

41.(A). Infundibular or subvalvular is the most common associated form of pulmonary stenosis; other types are recognized but less frequent.

42.(B).

43.(C). The mechanism of Tet spells is secondary to Infundibular spasm and/or decreased systemic vascular resistance (SVR) resulting in increased right-to-left shunting at the ventricular septal defect (VSD), and in diminished pulmonary blood flow. If left untreated, it may result in syncope, seizure, stroke, or death. Morphine sulfate IM is used for relaxing pulmonary infundibulum and phenylephrine IV for increasing SVR. Treating acidosis with sodium bicarbonate may reduce the respiratory center stimulation.

44.(B). The occurrence of cyanotic spell is an indication to proceed with surgical repair.

45.(E). Subacute bacterial endocarditis prophylaxis is indicated until 6 months after complete repair. In case of residual VSD, it should continue until it is closure.

46.(E). The arterial switch usually is performed within the first 2 weeks of life, when the left ventricle can still maintain systemic pressure.

47.(E).

48.(A). The BT shunt mimics the role of the ductus arteriosus. It is often put in place after the ductus closes naturally. It is used for defects that affect the flow of blood from the right ventricle, through the pulmonary artery, and to the lungs, like pulmonary atresia, pulmonary stenosis, and tricuspid atresia. Shunts are usually used for four to five months, until the child outgrows them and a second operation or definitive repair is needed.

49.(D). A temporary measure to keep the ductus arteriosus open in duct-dependent cyanotic congenital heart diseases meanwhile preparing for palliative surgery or definitive repair.

50.(A). In case of symptomatic hyperviscosity in CCHD and PCV >65%, the first assessment is to rule out acute causes as dehydration (which is clearly not the cause in this scenario); otherwise phlebotomy is indicated; gradual withdrawal of 10 ml/kg of blood with replacement with saline should be done. If PCV < 65%, we need to check for iron body status (s.ferritin or iron level), if low they need iron replacement otherwise no need for treatment.

- 51.(B). Depressed PR interval with increase rate, elevated ST segments, reduced QRS voltage or electrical alternans (variable QRS amplitude) are ECG findings in acute pericarditis which is usually involves all leads.
- 52.(C). And CNS abscess.
- 53.(E).
- 54.(D). Large mixing defects as single ventricle or truncus arteriosus can cause heart failure in neonatal period. Teratomas represent high-output cardiac failure.
- 55.(D). Reduction in pulmonary vascular resistance leads to increase the shunt across the defect and consequently to increase the pulmonary flow which predispose to heart failure.
- 56.(A). Distended neck veins, hepatomegaly and edema, are signs of right-sided failure.
- 57.(D). In case of heart failure with L-R shunt and when no signs of cardiogenic shock, the best option to start with loop diuretics, afterload reducing agent and digoxin. The diuretics are used to reduce the preload and also to avoid pulmonary edema. Afterload reducing agent (as ACEi), starting in a low dose which can be escalated gradually keeping an eye on blood pressure; it reduces angiotensin II which is a potent vasoconstrictor. Spironolactone is usually added to the medical regimen because of its effect on cardiac remodeling. In case of hypotension or cardiogenic shock, inotropes is indicated. It is important not to start the medication in aggressive way, excessive diuretics or ACEi may cause an abrupt reduction in end-diastolic pressure which can further reduce the stroke volume.
- 58.(C). Subcutaneous nodules are seen predominantly with chronic or recurrent disease.
- 59.(B). It consists of neurologic and psychiatric signs. It also is uncommon and often presents long after the infection. It may be the only presenting sign.
- 60.(A). Fever is usually in the range of 38.2°–38.9°C.
- 61.(C). Most patients with carditis (50-70%) will recover, the remaining need follow up for possibility of development of stenotic valvular lesions.
- 62.(E). Children with dilated cardiomyopathy present with signs and symptoms of inadequate cardiac output and heart failure as tachypnea and tachycardia, concurrent infectious illness may result in circulatory collapse and shock in children with dilated cardiomyopathies. Hypertrophic cardiomyopathy in infants is present with signs of heart failure; while in older children sudden death may be the initial presentation. Dyspnea, fatigue, chest pain, syncope or near-syncope, and palpitations may be present. The murmur is heard in more than 50% of children referred after identification of an affected family member. Restrictive cardiomyopathies the presentation usually includes dyspnea exacerbated by a respiratory illness, syncope and hepatomegaly.

63.(A). In dilated cardiomyopathies result in left atrial and ventricular dilation, a decreased shortening fraction, and globally depressed contractility. Asymmetrical septal hypertrophy and left ventricular outflow tract obstruction are seen in hypertrophic cardiomyopathies.

64.(D). The problem in hypertrophic cardiomyopathy is diastolic dysfunction where the end diastolic volume is reduced and the stroke volume consequently is reduced also. So the role of medications is to relax the heart muscle and to slow the heart rate so that the heart can pump more efficiently (inotropes is contraindicated). Other options are good for dilated cardiomyopathy while diuretics are helpful in restrictive type.

65.(B). Constrictive pericarditis secondary to radiation exposure with signs of increase in pulmonary pressure. The child received a course of irradiation which leads to option B, other common causes are postsurgical and idiopathic. TB is a rare cause. Presence of Kussmaul sign (inspiratory increase in jugular venous pressure) with predominance of right sided heart signs make the diagnosis is in favor of option B.

66.(C). It is a common complication after an open heart surgery due to immunological phenomena with up to 30% of cardiac surgery. Treatment is usually with anti-inflammatory medications and colchicine.

67.(A).